

SUPPORT FOR THE AMENDMENT

Support for the amendment to claim 3 is found beginning on page 4, lines 6-11 and page 8, line 25 through page 9, line 8 of the specification. Support for claims 9 and 10 is found on page 5, lines 23-24 of the specification. Support for claims 11 and 12 is found on page 6, lines 12-17 of the specification. Support for claims 13 and 14 is found on page 8, lines 21-24 of the specification. Support for claims 15 and 16 is found on page 9, lines 12-16 of the specification. Support for claim 17 is found on page 11, lines 6-9 of the specification. Support for claims 18 and 19 is found on page 12, lines 18-21 of the specification. No new matter would be added to this application by entry of this amendment.

Upon entry of this amendment, claims 1, 3-5 and 7-19 will now be active in this application.

REQUEST FOR RECONSIDERATION

The claimed invention is directed to a process for preparing a treated immobilized enzyme.

The use of immobilized enzymes for the decomposition of oils and fats has become of increased interest based on the discovery that partial glyceride compositions may provide advantageous health effects. Dried immobilized enzymes have been used however can suffer from a loss of activity. Improved methods based on contacting an immobilized enzyme with a reaction substrate, without drying in order to carry out an esterification reaction have been reported. Such methods have been described as providing high activity of the enzyme on and after the second reaction (page 2, lines 12-16 of applicants' specification). However, methods of preparing a treated immobilized enzyme of high activity can still be improved upon.

The claimed invention addresses this problem by providing a method for preparing a treated immobilized enzyme in which A) an immobilized enzyme is brought into contact, without drying, with 800-5,000% by weight of a fatty acid triglyceride, partial glyceride or mixtures thereof to provide a moisture content of from 5-50% by weight (claims 1 and 5); or B) contacting an immobilized enzyme, without directly drying, with a composition consisting essentially of a fatty acid, fatty acid triglyceride, fatty acid partial glyceride or mixtures thereof, followed by dehydration to a moisture content of 1-50% by weight based on the weight of the carrier (claims 3, 4 and 7). Applicants have discovered that both methods provide for an immobilized enzyme of high activity. Such methods are nowhere disclosed or suggested in the cited prior art of record.

Claims 3, 4, 7-8, 10, 12, 14, 16-17 and 19:

This embodiment of the claimed invention is directed to a method in which the immobilized enzyme is **sequentially** contacted with a composition **consisting essentially of** a fat or oil, then subject to a separate dehydration step.

The rejection of claims 1-6 as anticipated by Shimizu et al. EP 1,008,647, U.S. 6,716,610 and U.S. 2003/0096383 are respectfully traversed.

Shimizu et al. fail to disclose or suggest a process in which an immobilized enzyme in contact with an oil and/or fat is subject to dehydration in the preparation process.

The specification of Shimuzu et al. describes treating the immobilized enzyme with fats and/oils without drying (column 2, lines 17-23 of U.S. '610). The reference describes in detail at column 4, beginning at line 47 that the substrate is contacted with the immobilized enzyme by filtering, and when excess water content is removed, without drying, the immobilized enzyme is brought into contact with fats and/or oils as the substrate. After this contacting, the immobilized enzyme is filtered and is therefore good in storage stability

(column 5, lines 1-2 U.S. '610). As such, the reference nowhere discloses or suggests a separate dehydration step in the preparation process.

In contrast, the invention of claims 3, 4 and 7-8 is directed to a process in which, **after** the immobilized enzyme is brought into contact with a composition consisting essentially of a fat and/or oil, the immobilized enzyme is dehydrated to produce a moisture content of from 1-50% by weight based on the weight of the carrier. Applicants note that claim 3 has been amended to recite that the claimed steps occur **sequentially** and that the immobilized enzyme is contacted with a composition "consisting essentially of" a fat and/or oil which more clearly distinguishes the claimed method from a process in which an immobilized enzyme is used in an esterification reaction with an alcohol in which dehydration is conducted.

In the outstanding official action, it is noted that the reference describes at paragraph [0037] physical removal of water, the water content usually being 20% or more, preferably in the range of 40-60%. The official action appears to suggest that such a physical removal is a drying step. However, the reference identifies at paragraph [00034] that excess water is removed from the immobilized enzyme, then **without drying**, the immobilized enzyme is contacted with a fat or oil. The water content may vary but is 20% or more, preferably in the range or 40-60%. Thus, as a result of removing excess water but **without drying**, the water content was 20% or more, preferably from 40-60%, the same water content resulting from physical removal of water [0037]. Clearly the reference does not consider the physical removal of water as described in paragraph [0037] a drying step, but rather quite clearly identifies such a physical method of water removal as **not being a drying step**.

The official action also cites to comparative example 1 in which an immobilized enzyme is dried under reduced pressure, asserting that the present claims do not require any particular order. Applicants note that the claim step of "without directly drying, bringing the immobilized enzyme into contact with a composition consisting essentially of a fatty acid,

fatty acid triglyceride, fatty acid partial glyceride or mixture thereof” indicates that in between the immobilization step and the step of contacting with an oil, there is no drying step. Clearly, in comparative example 1, the immobilized enzyme is dried prior to any contacting with an oil.

Furthermore, claim 3 has been amended to recite **sequential steps** such that immobilization is followed by contacting with the fat or oil, then dehydrating.

In the advisory action, the examiner cites to paragraph [0037] as describing a drying step in an esterification process. The phrase use in paragraph [0037] is “deprived (or removed) of water sufficiently by a physical method” prior to contacting the substrate to effect the **esterification** reaction. In direct contradiction to the examiner’s interpretation, paragraph [0009] describes that the immobilized enzyme **for an esterification reaction is, without drying**, directly brought into contact with the substrate. As such the reference, as a whole, describes that the enzyme for esterification is used **without drying**, such that the phrase “deprived (or removed) of water sufficiently by a physical method” can not be interpreted as describing a drying step.

Finally, the official action notes that paragraphs [0038] and [0039] identify a drying step of an immobilized enzyme, such as by dehydration under reduced pressure, glycerol dehydration or a dehydrating agent. However, the use of a dehydrating step is concurrent with the performance of **an esterification reaction** in which glycerol and an acid are **reacted** in the presence of an immobilized enzyme. Applicants note that claim 3 have been amended to recite that the immobilized enzyme is contacted with a composition “consisting essentially of a fatty acid, fatty acid triglyceride, fatty acid partial glyceride, or mixtures,” language which does not allow for the presence of glycerol sufficient to conduct an esterification reaction as conducting esterification would destroy the basic and novel properties of the claimed invention in the preparation of an immobilized enzyme of high activity. It is noted

that esterification reactions are likely to cause deactivation of the enzyme and is therefore inconsistent with the goal of obtaining an enzyme of high activity.

As the prior art fails to disclose or suggest a separate dehydration step during the preparation of the immobilized enzyme, the claimed invention is clearly neither anticipated nor made obvious from this reference and accordingly withdrawal of the rejection under 35 U.S.C. §102(b) and 35 U.S.C. §102(e) are respectfully requested.

The secondary references of Shimizu et al. U.S. 6,258,575 and Ruthven have merely been cited to calculate a weight ratio of fatty acid triglyceride based on the carrier weight. However, the references fail to disclose a separate dehydration step and therefore do not render obvious the claimed invention.

As none of the cited references disclose or suggest a method in which the immobilized enzyme is separately subjected to dehydration, the claimed invention is clearly neither anticipated nor made obvious from this reference and withdrawal of the rejections under this section of the statute is respectfully requested.

Claims 1, 5, 9, 11, 13, 15 and 18:

This embodiment of the claimed invention is directed to a method in which an immobilized enzyme is, without drying, brought into contact with 800-5,000% by weight based on the weight of carrier of a fatty acid triglyceride, a fatty acid partial glyceride or mixtures thereof to provide a final moisture content of from 5-50% by weight based on the weight of the carrier.

None of the Shimizu et al. references disclose or suggest a moisture content of 1-50 wt. % **based on the weight of the carrier**. In addition, nowhere in the reference is there a general description of the amount of oil to be reacted with the immobilized enzyme. As such there is no teaching of the claim limitation of 1) contacting “with 800 to 5,000 wt.% of fatty

acid triglyceride, a fatty acid partial glyceride or mixtures thereof” or 2) a moisture content of 5 to 50 wt. % based on the weight of carrier.

In the absence of any express disclosure of these two claim limitations, the examples may none the less provide some guidance as to any inherent disclosure as to these two claim limitations. However, example 1 of the reference only reacts 400 wt. % of oil, based on the weight of carrier and that treatment of immobilized enzyme with this amount of oil provided for a moisture content, based on the weight of carrier of 66 wt.%. Therefore, the examples do not provide any suggestion of the claim limitation of 1) contacting “with 800 to 5,000 wt.% of fatty acid triglyceride, a fatty acid partial glyceride or mixtures thereof” or 2) a moisture content of 5 to 50 wt. % based on the weight of carrier.

Example 1 of the reference is explained in further detail below.

According to example 1 of Shimizu et al. ‘610 and EP ‘647 an immobilized enzyme on 10 grams of carrier is treated with 40 grams of soybean oil. The ratio of the amount of fat/oil based on the carrier is 400%, well below the claimed 800 wt. % minimum. Applicants have previously submitted the declaration of Mr. Manabu Sato, a named inventor of the above-identified application. The Sato declaration prepared an immobilized enzyme, and without drying treated the enzyme with various weight percentages of oil. 400 wt. % was used as exemplary of Example 1 of Shimizu et al. ‘610. 800 and 1,000 wt. % was used as examples according to the present invention. For the Examiner’s convenience, the table from the Sato declaration is reproduced below.

	Example	Oil amount for contacting with the immobilized enzyme (wt.% based on weight of the carrier)	The amount of oil in the immobilized enzyme after filtration (wt.% based on weight of the carrier)	Moisture content	
				* (wt% based on the weight of the carrier)	** (wt% based on the weight of the immobilized enzyme)
US 6,716,610	Example 1	400	150	66	21
Claimed Invention	Newly measured data	500	150	52	17
		800	150	42	14
	Example 1	1000	150	29	11

As is apparent, at a treatment ratio of 400% as used in Example 1 of Shimizu et al. '610 and EP '647, the residual moisture content based on the carrier remains high at 66%, well in excess of the claimed range of 5-50 wt. %. In contrast, when treated with amounts of 800 and 1,000 wt.%, the residual moisture content based on the weight of carrier was much lower at 42 and 29 wt.%, respectively. Accordingly, by treatment with an amount of 800-5,000 wt.% of oil, a residual moisture content based on the weight of carrier of 5-50% by weight may be achieved. As the reference fails to disclose or suggest such an amount of oil, nor provides a moisture content of 5-50 wt. %, based on the weight of carrier, the present invention is believed to be neither anticipated nor made obvious from this reference.

The advisory action suggests that the Sato declaration only speaks to an amount of 400% and that "all other amounts of oil are rendered obvious by the reference." However such statement fails to take into consideration the complete absence of any disclosure of an amount of oil to be contacted with the immobilized enzyme. The only guidance provided by the reference is the illustrated amount of 400 wt. %. There is no other suggestion. As such, the expectations from the reference are that all amounts of oil would provide result equivalent to those observed from using 400 wt. % of oil.

To the contrary, applicants have demonstrated that both endpoints of the claimed range of 800 to 1,000 wt. % of oil provide for a residual moisture content within the claimed range of 1 to 50 wt. %, and that outside of the claimed range of 800 to 1,000 wt. % of oil, that a residual moisture content in excess of 50 wt.% is observed. Therefore, the claimed range of 800 to 1,000 wt.% of oil is not obvious based on the lower residual moisture content obtained, an amount much lower than the 66 wt. % obtained in the example of the reference.

Furthermore, any assertion that it would have been obvious to optimize the water content to be from 5-50 wt. % is simply not supported by the art of record.

There is no description of any relationship between the amount of water and any result and accordingly the water content can not be optimized to obtain any known result.

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie* 195 USPQ 6, (CCPA 1977) (MPEP 2144.05(b))

Moreover, a moisture content within the claimed range is not inherent to the process of Shimizu et al. as there is no teaching to use an amount of oil which would result in a moisture content as claimed.

Withdrawal of the rejections under 35 U.S.C. §103(a) are respectfully requested.

The rejection of claims 3, 4 and 7 under 35 U.S.C. §112, second paragraph has been obviated by appropriate amendment.

Claim 3 has been amended as suggested by the examiner to delete the term "by." Applicants' amendment is not a narrowing amendment made for the purposes of patentability and therefore should not limit the scope of interpretation of the claims under the doctrine of equivalents. The metes and bounds of claim 3 are clear to those of ordinary skill in the art and accordingly withdrawal of the rejection under 35 U.S.C. §112, second paragraph is respectfully requested.

Applicants respectfully request an interview with the examiner prior to a first office action (MPEP 713.02)

Applicants submit this application is now in condition for allowance and early notification of such action is earnestly solicited.

Respectfully submitted,

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